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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/091,699  | 03/04/2002  | Robert P. Mandal     | AMAT/3771.P1/DD/LOW | 7928             |
| 32588   | 7590        | 01/28/2004           | K/JW                |                  |
| APPLIED MATERIALS, INC.<br>2881 SCOTT BLVD. M/S 2061<br>SANTA CLARA, CA 95050 |             |                      |                     |                  |
| EXAMINER<br>RAO, SHRINIVAS H  |             |                      |                     |                  |
| ART UNIT  |             | PAPER NUMBER         |                     |                  |
| 2814  |             |                      |                     |                  |

DATE MAILED: 01/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/091,699

**Applicant(s)**

MANDAL, ROBERT P.

**Examiner**

Steven H. Rao

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 December 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,5-8,16,18 and 21-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1,5-8,16,18 and 21-38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)                      5) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)                      5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_                      6) ☐ Other:

***Response to Amendment***

Applicants' amendment filed on has been entered on .

Therefore claims 1,5,18,22,25 as presently amended by the amendment and claims 26-38 presently newly added and claims 6-8,16,21 and 23-24 as previously recited are currently pending in the Application. Claims 2-4,9-15,17 and 19-20 have been cancelled.

It is noted for the record that in response to Applicants' contention in the second paragraph of page 8 of the amendment ( filed on 12/15/2003) that Applicants' filed a response on May 22, 2003 entitled " Preliminary Amendment " in response to the then outstanding Advisory Action mailed on May 07, 2003 and did not include a RCE request with the preliminary amendment of May 22, 2003.

Applicants then filed a RCE request in response to the second Advisory Action mailed on May 29, 2003 on June 11, 2003 wherein the box referring to the Enclosures (included with the RCE was marked to indicate An amendment/Reply and also an IDS was enclosed with the RCE ,.

However neither the allegedly enclosed amendment/Reply and the IDS were received by the Office and an action ( second advisory action ) had already been mailed on May 29, 2003 and the fact that Applicants' had referred to their response filed on May 22, 2003 as " Preliminary Amendment" which is generally filed prior to the examination of the Application or with a RCE and this amendment i.e the previously non entered response filed on May 22, 2003 as " Preliminary Amendment" was entered upon filing of the RCE and Applicants' only brought to the attention of the

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Office their alleged non-authorization of the entry of the amendment filed on May 22, 2003 after the first non-final rejection in the RCE was mailed on August 28, 2003, it is noted that only option left was entry of the preliminary amendment.

***Information Disclosure Statement***

The Ids filed on December 15, 2003 has been entered.

The documents listed on the enclosed PTO-1449 have been considered and the 1449 initialed to indicate consideration of the references listed therein.

The contract staff has been instructed to enclose a copy of the initialed PTO-1449 along with the instant Office Action.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1,5-8,16,18,21-25 and 26-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grill ( U.S. Patent NO. 6,312,793, herein after Grill) in view of Scholsky et al. ( U.S. Patent No. 5,010,166, herein after Scholsky) both previously applied . For response to Applicants' arguments see section below.

With respect to claim 1 Grill describes a method for depositing a low dielectric constant film including introducing a siloxane comprising two or more silicons and from two to five carbons bonded to the silicons into a processing chamber (Grill col.3 lines 15-20, Grill col. 4 lines 45-50).

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Grill describes the introduction of at least one oxidizable chemical comprising an aldehyde without specifying the aldehyde to be a furfuryl or Furfuryloxy and noepentyl compounds.

However Scholsky in col. 16 lines 16 and 62 describes the use of furfuryl or Furfuryloxy and noepentyl compounds to form a low dielectric thermoset coating ( film) having superior hardness , flexibility and impact resistance.

Therefore it would have been obvious to one of ordinary skill in the art to use Scholsky's aldehyde to be a furfuryl or Furfuryloxy and noepentyl compounds in place of Grill's unspecified aldehydes, etc. , the motivation to make the above substitution is to form a low dielectric thermoset coating ( film) having superior hardness , flexibility and impact resistance. ( Scholsky col.1 lines 35 to 38).

The remaining limitations of claim 1 are ;  
reacting the siloxane and the at least one oxidizable chemical with an oxidizing gas at a temperature that retains the member in a conformal layer ( Grill figs. 2A and B, col. 6 lines 54-61),and converting the member to dispersed voids. ( Grill col. 8 lines 29-30).

With respect to claim 5 it repeats the steps of claim1 above and wherein the one oxidizable chemical comprises silicon ( Grill col. 3 line 14).

With respect to claims 6-7 wherein the oxidizable chemical is silane and the silane is dimethylfurfuryloxy silane ( Grill col. 3 line 20).

With respect to claims 8 and 16 wherein the at least one oxidizable chemical is disiloxane: 1,3 dimethyl- 1,3- ditertiabutyl disiloxane and 1,3-dimethyl- 1,3- ditertiarybutoxy disiloxane ; 1,1,3,3-tetramethyldisiloxane, 1,3,5,7-

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tetramethylcyclotetrasiloxane ; 1,3-dimethyl-1,3-ditertiarybutyl disiloxane; 1,3-dimethyl-1,3-ditertiarybutoxy disiloxane . ( Grill col. 3 lines 14-26 and Tsukane col. 7 lines 35-65).

With respect to claim 18, wherein the method further comprises depositing a silicon carbide layer on the conformal layer prior to converting the member to dispersed voids . ( Grill col. 54-col. 6 lines 12).

With respect to claim 21, Grill describes the method of claim 1, wherein the at least one oxidizable chemical is difurfuryl ether. ( Grill col.3 line 34-35).

With respect to claim 22, Grill describes a method of depositing a low dielectric constant film, including : introducing a siloxane comprising two or more silicones and four or more methyl groups bonded to the silicon in to a processing chamber (Grill col.3 lines 15-20) , introducing at least one oxidizable chemical comprising a cyclic ring consisting of carbon, oxygen and hydrogen into the processing chamber, (Grill col. 3 line 33) reacting the siloxane and the at least one oxidizable chemical with an oxidizing gas at a temperature that retains the cyclic ring in a conformal layer ( Grill figs. 2A and B, col. 6 lines 54-61 ) converting the cyclic ring to dispersed voids (Grill col. 8 lines 29-30)

With respect to claim 23, Grill describes the method of claim 22, wherein the oxidizable chemical is selected from the group consisting of vinyl-1,4- dioxinyll ether, vinyl furyl ether, vinyl-1,4-dioxin, vinyl furan, methyl furoate, furyl formate, furyl acetate, furaldehyde, difuryl ketone, difuryl ether, difuryl ether, furan and 1,4-dioxin. (Scholsky col. 16 lines 16 and 62).

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With respect to claim 24, wherein the oxidizable chemical is difurfuryl ether.  
(Scholsky col. 16 lines 16 and 62).

With respect to claim 25, Grill describes the method of claim 24, wherein the siloxane is selected from the group consisting of 1,1,3,3- tetramethyldisiloxane, 1,1,5,5- tetramethyltri siloxane and 1,1,3,5,5-pentamethyltri siloxane, 2,4,6-trisilaoxane, and cyclo-1,3,5,7-tetrasilano-2,6-dioxy-4,8-dimethylene . ( Grill col. 3 lines 14-26),

With respect to claims 26,29,33 Grill describes the method of claim 1 etc.  
wherein the dispersed voids are formed by annealing the substrate . ( Grill col.3 lines 15-20).

With respect to claims 27, 31 and 34 Grill describes the method according to claim 1 etc. wherein the siloxane comprises four or more methyl groups bonded to the silicon. (Grill col.3 lines 15-20).

With respect to claims 28, and 32 Grill describes the method according to claims 1 and 5 wherein selected from the group consisting of 1,1,3,3- tetramethyldisiloxane, 1,1,5,5-tetramethyltri siloxane and 1,1,3,5,5-pentamethyltri siloxane, 2,4,6-trisilaoxane, and cyclo-1,3,5,7-tetrasilano-2,6-dioxy-4,8-dimethylene , 1,3,5,7-tetramethylcyclotetrasiloxane, and octomethylcyclotetrasiloxane. ( Grill col. 3 lines 14-26).

With respect to claim 30, Grill describes the method of claim 5, further comprising introducing a siloxane comprising two or more silicon and from two to five carbons bonded to the silicon into the processing chamber and reacting the siloxane

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with the oxidizing gas. ( repeats the steps of claims 1,5 8 etc. above and rejected for reasons set out above).

With respect to claims 35 and 37 Grill describes the method of claims 1 and 5 , wherein the oxidizing gas is carbon dioxide . ( Grill col. 6 lines 1-5).

With respect to claim 36 and 38 Grill describes the method of claims 35 and 37, wherein the at least one oxidizable chemical comprises a neopentyl group. Scholsky in col. 16 lines 16 and 62

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 5-8,16,18,21-25 have been considered but are not persuasive for the following reasons.

Firstly it is noted that Applicants' have attempted to broaden the claims over those previously recited , however the same references previously applied are more than adequate to reject the broadened claims.

Applicants' first contention that Scholsky does not teach or suggest the polymer coatings have a low dielectric constant is not supported by the teachings of Scholsky, which in col. 5 lines 58-62 states :

**thereof (i.e., during the propagation of the polymer chain), particularly in media of low dielectric constant. "Ionic polymerization" (like "addition polymerization", mentioned above) thus also contemplates discrete "initiation" "propagation" and "termination" steps.**

Therefore there is suggestion or motivation in the combination of Scholosky and Grill to use compounds provided in Scholsky as components of the polyol polymer in the silicon-containing , low dielectric constant multi-phase film of Grill.



There fore the combination of Grill and Scholosky teaches all the presently recited limitations of the pending claims.

Applicants' next contention wit respect to claim 5 citing Grill col. 3 line 14 , namely the precursor containg at least some of Si,C, O and H atoms , " does not teach or suggest an oxidizable chemical comprising silicon and a furfuryl, furfurryoxly or neopentyl member " is totally at odds with the outstanding rejection wherein it was stated that Grill does not specify its oxidizable chemical to be Furfuryl etc. and that Scholsky reference was applied to show Furfuryl etc. and the combined teachings of Grill and Scholsky teaches the an oxidizable chemical comprising silicon and a furfuryl, furfurryoxly or neopentyl member as staed in the rejection.

It is noted that Applicants' are attempting to engage in piecemeal

" In response to Applicants' piece meal analysis of the references, it has been held that one cannot show non-obviousness by attacking references individually where as here, the rejections are based on combinations of references. In re Keller , 208 USPQ 871 ( CCPA 1981).

Applicants' contention with respect to claim 22 that Grill does not teach ring structures containing C and H in its oxidizable chemical is not persuasive and directly contrary to Grill's teachings because Applicants' are not addressing the outstanding rejection.

Grill col. 3 lines 13-20 ( reproduced below) state :

The first precursor utilized may be selected from molecules containing at least some of Si, C, O, and H atoms. Oxidizing molecules such as  $O_2$  or  $N_2O$  can be added to the first precursor. Preferably the first precursor is selected from molecules with ring structures such as 1,3,5,7-tetramethylcyclotetrasiloxane (TMCTS or  $C_4H_{16}O_4Si_4$ ), tetraethylcyclotetrasiloxane ( $C_8H_{24}O_4Si_4$ ), decamethylcyclo-

From the above teaching it is clear to one skilled in the art that any combination of Si, C, O and H may be used including only Silicon, carbon and oxygen in Grill's oxidizable chemical.

Applicants' repeat their earlier arguments on page 11 of their response which are not found above and the above response to Applicants' arguments are incorporated here by reference.

Therefore all of the Applicants' currently pending claims are obvious and rejected.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Steven H. Rao whose telephone number is (703) 306-5945. The examiner can normally be reached on Monday- Friday from approximately 7:00 a.m. to 5:30 p.m.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. The Group facsimile number is (703) 308-7722.

Steven H. Rao

Patent Examiner

January 20, 2004.



LONG PHAM  
PRIMARY EXAMINER